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ABSTRACT

This paper is a report of three case studies considering the instructional uses of technology in public school classrooms. A level of technological proficiency was determined for each school that participated in the research through the use of a series of surveys, teacher interviews, and observation. Once a level of proficiency was determined for each case, specific strategies used at each school to promote technology integration were evaluated. Data collected and analyzed for each case indicated that strategies for strong technology integration must address three specific areas: the school's vision of integration; the leadership at each school; and the training method used for staff development. Results indicate that public schools that addressed all three areas adequately were able to achieve a higher level of technology integration, with improved acceptance and attitudes towards technology in everyday use by both teachers and students. (Author/MES)

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More than Inventory: Effective Integration of Instructional Technology to Support Student Learning in K-12 Schools

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Abstract: This paper is a report of three case studies considering the instructional uses of technology in public school classrooms. A level of technological proficiency was determined for each school that participated in the research through the use of a series of surveys, teacher interviews, and observation. Once a level of proficiency was determined for each case, specific strategies used at each school to promote technology integration were evaluated. Data collected and analyzed for each case indicated that strategies for strong technology integration must address three specific areas; the schools vision of integration, the leadership at each school, and the training method used for staff development. Results indicated that public schools that addressed all three areas adequately were able to achieve a higher level of technology integration, with improved acceptance and attitudes towards technology in everyday use by both teachers and students.

Introduction

State and national agencies regularly reference technology integration as a real need if public schools are to be considered technologically proficient as they move into the next century. However, the specifics of how to effectively integrate technology into the K-12 curriculum are still largely undetermined. The confusion about how to effectively integrate technology may come from a basic misunderstanding about what the term technology integration means. If one was to ask teachers what technology integration is, many different answers would most likely be received. Although technology integration is considered a real need, a cohesive understanding about what technology integration is, does not currently exist.

Predominately schools use one of two methods to place computer technology in front of students. The first method follows the instrumentalist view. This view sees technology merely as a tool or instrument to be used by teachers and students for teaching and learning. Research from this view has been involved in developing better human-computer interfaces, improving graphics, and making software tools more efficient, rather than in better pedagogical techniques (Jih, 1996). Haas (1996) states however, that this view of technology places: "...teachers and scholars in a subordinate position to technology, removing them from the realm of technology development and critique and setting them in positions to be merely receivers of technology."

Since the use of technological tools will be an important skill once students enter the work place, schools cannot discount this need. However, schools that have tried to follow this view completely have found difficulty in doing so. Two problems develop from the total acceptance of the instrumentalist view. First, this view supports the belief that the quality of a student's work is dependent upon the quality of the tool. This perpetuates what is known as the *latest is the greatest syndrome*, where schools constantly fight the financial battle of trying to have the latest technological innovations so that students will hopefully produce the best work. Financial constraints hinder K-12 schools from updating their technological

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resources at a speed equivalent to that of the development of these resources. Secondly, schools following this view typically make the teaching of skills their primary instructional method. It is felt that if students learn the menus and features of particular software, they will be able to use these skills in the work place. Industry however, indicates that they are dissatisfied with the quality of students entering the work place. Although students appear to have spent a great deal of time with various software, they do not seem to know when and how to apply their software skills to work related problems.

The second method of integration comes from the transparent view of technology which sees various technology as being basically immaterial. Schools that follow this view tend to place whatever technology is available in either labs or in classrooms and then expect teachers to find some place for it in the curriculum. Since the technology is immaterial, whether or not a teacher chooses to use the technology in their classroom or in their teaching is simply a matter of choice. This view removes the need for schools to have the latest technology, but creates the problem of justifying the existence of technology that is often out of date and inadequate to the school community. This view also perpetuates the belief of teachers that they are integrating technology as long as they add it onto their teaching at various times throughout the school year.

As with the instrumentalist view, administrators also have problems in the evaluation of their technology programs. Since this view does not see the technology as being an essential part of the learning environment, outcomes attributed to the use of technology in the classroom are very hard to establish and measure. Another problem with this view is that teachers who are highly motivated to use computer technology in their classrooms must rely largely on trial and error methods for finding a place for technology in their teaching day (Picciano, 1998). Simon's (1990) word *satisficing* applies well to this situation. Teachers commonly must accept a technology that, although it satisfies the situation, it causes the teacher to sacrifice an optimal solution to an instructional problem. Myhre (1998), argues however, that most teachers are not highly motivated to use computer technology in their classrooms. Instead, teachers find it difficult to find a place in their teaching practice for computer technologies at all. In a study evaluating the use of technology by both pre-service and in-service teachers, participants indicated that much of the software did not meet their instructional needs. In order to use available existing software, the teacher was required to mold their pedagogical practice around the technology. When this occurs, technology becomes the focus of the learning, not a component to enhance learning.

This study looks at schools considered to be technologically proficient by current standards and then works to determine trends and strategies that K-12 schools should consider in order to successfully integrate computer technology into the teaching environment.

The Study

This is a first report of a continuing study which seeks to identify trends in technology integration among K-12 schools considered to be technologically proficient. In this study, individual public schools in the Texas panhandle were identified as having a high commitment to the integration of technology through a series of visits to schools to identify those that not only had a high degree of technology hardware and software, but also had committed a substantial amount of the teaching day to the integration of technology. To help identify schools as being technologically proficient, current Department of Education guidelines for the evaluation of technology programs were used (USDOED, 1998). The Department of Education guidelines stated that a school should have appropriate hardware and software resources in order for technology integration to take place. Using the USDOED survey instruments as a guide, three schools were selected as cases for this report. Two of the schools were in small rural locations and one was in a more urban location.

The first step for identifying technological trends was to develop a theoretical perspective from which to guide each case study. This perspective was used as a lens through which the series of interviews and surveys used for data collection could be viewed. Current literature indicates that technology integration should be more than simply having hardware and software available for teachers and students to use. The literature illustrates that there should be a blend between the common methods of technology use in schools instead of taking either method to its extreme (Haas, 1996). Therefore, this study views integration as the matching of appropriate technology to a particular educational task in order to solve instructional problems. This matching of technology to task should not occur only during "computer time," but instead should be a continuous process throughout the class day. Technology should not be added on as an additional teaching

area, but instead should be used much like a pencil, to enhance the learning experience each day in many different content areas.

Once this perspective was developed from the literature, survey and interview instruments were developed to collect data and identify themes that would help mark principle issues of integration in the case schools. Two principle types of data collection were used in this study. One was the use of a survey to identify demographic information, teacher perceptions about technology integration, integration strategies, leadership, and staff development. Further, the survey instrument contained an index of instructional use, developed to help identify the true degree of integration being accomplished by each school. The survey instrument was developed by the researchers and then submitted to a panel of peers for suggestions on improvements and identification of problem questions. Once comments were received back from the panel, a second version of the instrument was produced which incorporated the feedback from the panel. The second version of the instrument was then administered to a pilot group of teachers for evaluation and suggestions. After incorporating changes identified after the pilot administration of the survey, a final version of the instrument was produced for use in the study.

The second type of data collection was done though the use of interviews of both teachers and administrators at each school studied. Again using the literature as a guide, interview scripts were developed that followed for each interview. Each of the interviewers received training in the use of the scripts and were asked to follow the scripts exactly as they conducted their interviews with teachers and administrators. Observational data was also collected by the researchers so that a better understanding of the context for the survey and interview data could be achieved.

After the data was collected, an analysis of the data yielded the following results.

Results

The analysis of survey data pertaining to demographics yielded the following results. The age range for teachers in the cases studied showed a very even distribution between teachers in the various age groupings used. Teachers 21-30 years of age represented 29% of the teachers surveyed. Teachers 31-40 years of age represented 24% of the teachers surveyed. Teachers 41-50 years of age represented 25% of the teachers surveyed. And teachers 51-60 years of age represented 20% of the teachers surveyed. Teachers in the 61+ years of age were the only age range not representing an fairly equal distribution coming in with only 2% of the teachers surveyed in this age range.

In the schools studied, the years of experience represented by both new and more experienced teachers also were evenly distributed. Years of experience represented by the teachers were closely correlated with the age of teachers at the case schools, indicating a stable faculty at each school, with a very low turn over rate.

Previous research has indicated that teachers, especially in older age ranges, tend to have a very low self-perception about their technology skills. Research has also indicated that females tend to have a lower self-perception than males relating to their use of technology. However, the teachers in this study indicated that they felt that their technology skills were high. 55% of the teachers surveyed indicated that they had high technology abilities with 16% of the teachers indicating that they had average technology abilities. 29% of the teachers indicated that they felt that they had low technology abilities. Nearly all the teachers at the schools were female with only two teachers and one principal being male.

The results of the instructional use index and the individual teacher interviews yielded the following themes that emerged as key factors in the integration of technology in these schools.

Theme 1: Integration Strategy. The strategies used by individual teachers were very diverse. However, the main focus indicated that teachers must have a clear vision of an integration strategy in order for integration to occur. Teachers who did not have a clear view of integration for their teaching situation tended to feel very frustrated. The most common comment made by teachers that did not have a clear view of integration and consequently did not have a strong integration strategy, was that they did not have enough time to add the integration of technology on top of everything else that they were to teach each day. These teachers felt that they should be released from teaching all subjects or from having to integrate technology. Time repeatedly was indicated as a factor that must be dealt with if technology integration was to occur.

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Theme 2: Leadership. Another theme that developed throughout the three case schools studied was the theme of leadership. Leadership was seen as more than just mandates given by administrators instructing teachers to integrate technology. Further, leadership had to be more than simply providing hardware, software, and technical support. Although having these resources was seen as highly important, the administrators involvement in the integration process was seen as a key factor in moving a school towards proficient technology integration. Examples given were where administrators were seen improving their own technology abilities through the attendance of staff development with classroom teachers, using technology in daily administrative and communication task, and allowing teachers time to experiment with new teaching methods utilizing technology.

Theme 3: Staff Development. The third theme focused upon staff development. In these schools, technology related staff development was regularly scheduled for all teachers. Teachers normally have an average of 5-6 opportunities per month in which they can choose to participate. These regularly scheduled training opportunities not only help keep the teachers aware of the need to improve their technology integration practice, but also help teachers keep up with the ever changing face of technology. Further, as teachers have a higher exposure to technology integration methods, self perception about their ability to use technology also increases. As a teacher's self-perception increases, so does their motivation to use technology in their classroom.

Theme 4: Teacher Turn Over Rate. The last theme found in the current data collection was the theme of teacher turn over rate. In the schools that seemed to have a high degree of technology integration, there was also a high degree of stability among faculty. The three cases identified as being technology proficient all had the trend of having a very low teacher turn over rate. This trend was reflected in the demographic information with regard to age and years of experience. It would seem that teachers in a stable work environment were more accepting of trying new teaching strategies in their classrooms. In less stable environments teachers may tend to revert back to standard teaching strategies such as using standard textbooks and worksheet materials.

Discussion

As seen in this report, there are several factors that can influence the effective integration of technology into the classroom. The four primary themes that emerged all warrant much discussion and will likely evolve as this research continues. However, trends between the different cases studied so far can still be seen.

Integration strategies are a primary concern to any school wanting to effectively integrate computer technology into the teaching environment. A school must have a clear vision of its integration strategies and this vision must be appropriately communicated to all members of the school community. Schools typically still follow either the view of using computers as tools or instruments for teaching or they view the technology as being transparent. It may be that a more balanced approach to technology integration is needed. An approach in which the technology is not integrated by adding it on top of other teaching activities that a teacher conducts throughout the day, but instead, one where the technology is seamlessly integrated in all content areas. By seamlessly integrating technology into all areas of the curriculum, issues of time will be minimized since the technology is not additional to the existing curriculum, but is an integral part of the curriculum.

Leadership is also an important factor in that it cannot be approached from a punitive posture. Administrators must themselves have a clear vision of technology integration for their school and then effectively communicate that vision to their teachers. This communication does not appear to be best when it comes in the form of mandates, but instead should be communicated by example. Allowing teachers an opportunity to try new teaching methods utilizing technology is essential. This may mean that administrators may have to accept that not all of the methods that teachers may try will be successful for a given school. However, this must be seen as an evolutionary process needed if technological proficiency and integration is to be achieved in a given school.

Strong staff development is essential for the technologically proficient school. To achieve the integration of technology, teachers must be exposed and trained in a variety of methods for integrating

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technology into their classrooms. It would appear that staff development is most successful when scheduled regularly with multiple opportunities for attendance. There is also a consideration of the type of staff development utilized. Schools can either try teaching skills, and then expect teachers to understand how to use their new skills, or they can teach methods of integration that help meet teaching objectives. Some combination of both may be most appropriate for most schools.

Lastly, maintaining a low teacher turn over rate may be a strong indicator of schools that may be ready for the integration of technology. If teachers are to try new teaching methods and use new technology, they must feel they work in a stable environment. Teachers working in schools that have low teacher turn over rates may be more receptive to technology integration.

As with any organization, schools have a variety of factors that can influence the use of technology. This study has been an attempt to begin looking at some of the trends and factors that can indicate integration of technology in today's schools. It should be noted that this is an on-going study that is far from complete. However, as schools continue to advance utilizing technology in their educational settings, many trends and ideas are sure to continue to emerge.

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